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ORGANIC GARDENING—Emmaus, Pa.

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With The Editor

Rocks—Parents of Soil

FOR millions of years the earth's crust has been "weathering"—its rock structure decomposing through the action of heat and cold, winds, rains, fogs, glacier movement, climatic change, and the life and death cycles of plants and animals. From the activity of the lowly lichen—a peculiar association of microscopic plant, the alga, and a fungus, acting in a partnership, the "weathering" of rock begins. Digging their tiny roots into the rock and existing on air-borne particles of dust a process of evolution in plant life gradually takes place until we have the teeming life of a tropical jungle, with its dense growths, quick decay, and vast census of animal and plant life and organisms. Soil is constantly being created by the factors of climate, rock and soil structure, and plant and animal life.

The soil that is thus being formed represents only a thin skin, compared to the rock mass which is still weathering and forming soil underground. This continuing addition of soil takes the place of some of the surface soils carried off by erosion. The underground mass of rock is the soil parent and plays an important rôle in the action and history of the soil's cultivation, although too little is as yet known about it.

It has been discovered that the well-being of cattle and human beings is closely related to the kind of soil which grows their food, and this, in turn, is influenced by the kind of rock out of which the soil is formed. Miscellaneous Publication No. 369 of the U. S. Dept. of Agriculture, entitled *The Mineral Composition of Crops* represents a study and correlation of cases that point to the critical need of further investigation in this field.

According to Publication No. 369 the following rock formations are apt to weather into inferior soils:

sandstones
aplites
granites
Pierre shale
Cretacious rocks
air-borne pumice (an acid lava)
Volcanic

The better soils are on limestone, basalt, dolerite, diorite, and gabbro formations. With regard to gneiss soils the results are sometimes good and at other times unfavorable. There are so many cases given that

it is difficult to know where to begin to summarize. In 1931 in Florida a "salt sick" disease, an anemic condition of cattle, was found to occur in practically all parts of that state but only on light, sandy soils. No such sickness occurred on clay soils. In New Zealand in 1932 it was found that bush sickness was found mostly over granitic formations. A bone disease of livestock was discovered in Australia in 1895 in cattle fed largely from granite soils, where there was a deficiency of lime.

In 1920 there was a deficiency disease called "creeping sickness" in southern Alabama along the Coastal Plains which was found only among people who lived on sandy soils low in lime content. In 1924 in South Texas there was noticed a fatal disease in cattle called "loin disease" or "down-in-the-back", in a section where the soil was notably lime-deficient. A nutritional anemia in Florida was discovered in 1934 in the flatwoods country which affected 96 per cent of the children in that section. The soil is known as Leon which is thin and sandy, and low in lime content. Six miles away where the soil overlays hard rock phosphate only 3 per cent of the children have this anemic condition. These are only a very few of the cases mentioned in Publication No. 369, but they indicate a pressing need for a national survey of soil origins in connection with the incidence of human disease in each geologic formation.

I recently read in Time (Aug. 21, 1944) that U. S. dentists in the Aleutians were shocked at the deplorable condition of Aleut children's teeth. They noticed that their tonsils were even worse. The account then mentions the children's lava-toughened feet and the volcanic hills of the island. This would indicate a severe deficiency of lime and phosphates in the soil along with the unfavorable nature of volcanic lava soils in general which reflects itself in the nutritional quality of the food raised there.

In Deaf Smith County, Texas, the condition is entirely reversed. This section figured in the newspapers a few years ago when it became known as "the county without a toothache". The soil in Deaf Smith derives from rocks that are rich in lime and phosphorus and contain some fluorine which is important in the making of bone and teeth. Even when strangers come to Deaf Smith County, the cavities in their teeth glaze over and progress no further. The farmers bring in spindly cattle from Mexico and in a short time make fine big-boned animals out of them. What kind of rock structure you have under your soil is therefore important. It is a large factor in determining the nature of good soil.

In northwest India there is a race called the Hunzas who are about the healthiest people in the world. They get no cancer, appendix trouble or most other diseases. Right across the river from them live the Nagyrs, who are of the same race, but whose health record is entirely different. The Nagyrs are subject to goitre and many other diseases to which the Hunzas seem to be immune. The Nagyrs are of smaller stature and dour looking as compared to the charming and agreeable Hunzas. The main reason is the organic manner in which the Hunzas produce their food. From what I can gather, another reason for these differences is that the Hunzas have a much more desirable geologic formation under the soils on their side of the river.

I have read more than a dozen books written by travelers who have passed through the Hunza

and adjacent country. As they travel they always seem to note granite mountains and granite formations but as regards Hunza itself I came across only one mention of the stone formation, the fact that Rakaposhi, the glacier-topped mountain that is more than 20,000 feet high and which dominates Hunza is of limestone formation. Does this limestone formation extend itself also to Nagyr? I have written to many government agencies, and have investigated in geologic records but as yet have not found out.

In reading an excellent book on the Hunzas called *Language Hunting in the Karakoram* by E. O. Lorimer (George Allen and Unwin-London-1939) a clue to the answer may have been given. Both the Hunzas and the Nagyrs grind their grain with huge hand-made stone mills. When a stone breaks, the miller will take his tools and whittle out a fairly round stone out of the rocky mountainside. Mrs. Lorimer noticed that the top-stone had to come from one side of the river and the bottom stone from the other side. She doesn't recall whether the Hunza side furnished the top-stone or whether it came from Nagyr. But evidently one of the stones must be harder than the other. Limestone is very soft in comparison to granite. If the top-stone is the softer, which is likely, and comes from Hunza, then the Nagyrs have a granitic soil parentage. For the time being I am assuming that this is the case, for other indirect evidence seems to bear this out.

Sir Robert McCarrison who spent eight years as physician and medical investigator among the Hunzas (1904 to 1911) mentions a situation which may also be an indication that their soil derives from limestone. In his Mellon Lecture delivered at the University of Pittsburgh in 1922 he said: "It fell out that the cultivable lands of one of these races (Hunza) were no longer sufficiently extensive for the increasing population. To meet this it was decided to colonize another tract which had never previously been cultivated. A dozen families were settled there, and they made shift to grow upon its granite and infertile soil such grains as they could". Ten out of the twelve of the male adults later developed paralysis of the lower limbs due to the disproportionate use in the food of the vetch *Lathyrus satious*, as the soil could not grow a sufficiency of wheat. In his various published works, McCarrison continually mentions the fertile Hunza soils. Since he specifies that the new colony "made shift to grow upon granite and infertile soil", the inference is that Hunza did not itself have a granite soil.

Roger Babson, the financial expert, in his syndicated newspaper column of February 4, 1944, said: "Some years ago when I was in Switzerland making a study for the *New York Times*, a Swiss scientist said to me: 'Europe will always have trouble with those Prussians. There is something in the soil of Prussia which grows people with that fighting instinct. European peace is unalterably linked up with the minerals of the soil.'"

This bears looking into. Germany is noted for its tremendous potash deposits. No doubt much of her geologic underpinning consists of potash-containing rocks with a minimum of lime. Besides having this highly specialized type of soil, Germany, according to the 1928 figures, uses more than seventeen times the amount of chemical fertilizers we use here in the United States, a practice which may, and very likely does, aggravate the difficulty. The Germans may behave the way they do, owing to the

mineral content of their soil, overrich in some elements, and doubtless deficient in many others.

In Japan you may have a somewhat analogous situation. The Japanese islands consist mainly of a volcanic ash soil, very poor in lime, and considered very low in the scale of soil values. I have before me the record of many cases which show that such soils cause diseases in cattle, such as bush sickness, nakuruitis, bone diseases, and others. This is thoroughly covered in Publication 369 mentioned above. We know that the Japanese are short in stature, not generally of very good health, and lower than average in longevity. We have also recently learned that they have peculiar ways mentally. There are ways of counteracting such soil conditions. It may be that Japanese soils need tremendously heavy dressings of limestone, of phosphatic rocks, dolomites, etc., the materials for which would have to be imported from other countries.

Perhaps the new world organization to maintain peace ought to study this subject thoroughly; it may have a great deal to offer in explaining national behavior.

This also, is one of the most important matters to be considered by the purchaser of a farm before he makes the final decision. What kind of soil is it? What kind of soil parentage has it? This is seldom easy to determine, categorically, as glacial limestone deposits are sometimes found or granite structures and other complex conditions may be found. The purchaser can usually get good local advice from the county agricultural agent.

Dr. C. E. Greene in *The Cancer Problem* (Greene and Son, London) says that cancer is least frequent in districts which lie on a limestone geologic formation. For many reasons, you will agree, the use of ground limestone, phosphate rock and dolomite have important places in agriculture as soil amendments.

Another aspect of soil formations as they affect the health of people was in recent years studied by a group of French physicians and chemists. Professor P. Schrumpf-Pierron and Doctor Pierre Delbet read a series of papers before various academies in Paris. These were published in the *Bulletin de l'Institut d'Egypt*, Vol. XIV (1932) and in the *Bulletin de l'Academie de Medicine*, Vol. III (1934), suggesting a direct relationship between the incidence of cancer and the rock formation from which the soil derives. Certain rocks of a dolomitic character which are a form of limestone rich in magnesium, produce a soil which seems to be low in cancer incidence, whereas rock formations such as granites which are rich in potash have the reverse effect.

Potash is slightly radio-active and seems to be suspect as a cause of cancer. The potash-magnesium ratio in soils and plants has long puzzled scientists. If magnesium goes down then potash goes up. In many orchards due to increasing potassium, magnesium deficiency diseases occur.

These French scientists carefully plotted maps which indicated the extent of magnesium in the geologic formations of various parts of the world, and then they placed on top of it the cancer mortality figures for those regions. The agreement is startling. Egypt, a country rich in magnesium, shows an extremely low cancer rate. Certain parts of France also show a similar situation. There are doubtless other factors, known and unknown, in the cancer equation, the sulphur theory of Dr. Greene, for instance, but in this connection one must

point out that sulphur is found more often in granites and the other rock formations listed as producers of inferior soils, than in limestone.

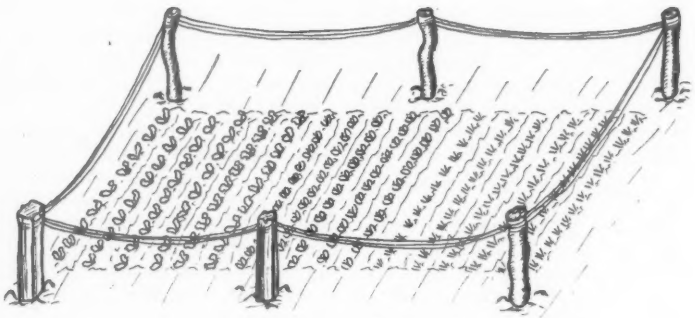
Dolomite, a limestone rich in magnesium, would, therefore, seem to be an essential soil amendment, to be used in liberal quantities in the compost heap or pit, or for top-dressing generally for all plants that do not require an acid soil.

The question may well be asked, "What shall I do if my farm happens to be located on one of the unfavorable soil formations?" Use liberal amount of the lime, phosphate rock and dolomite and none of the strong chemical fertilizers. Try and get oyster shell lime and other organic amendments. Make and apply as much compost as possible. I believe you can gradually build up a perfectly safe soil, the organic way.

J. I. RODALE

Gardening Devices

Enclosures



AMONG the many gardening devices, the *Enclosure* is the oldest. Garden as well as Yard, both being the same word by origin, mean the enclosed or fenced-in place. Where modern Victory Gardens are made on large lots subdivided by the enthusiasts, little enclosures as shown above may save much disappointment from careless neighbors trampling down the young seedlings. Some gardeners use identification seedlings of quick growing varieties, such as spring radishes, to mark their rows of slower growing vegetables; our temporary enclosures may take the place of identification planting; once the seedlings are up and can be seen, the hand-made fence is moved to another part. By the way, it also may help in puzzling the birds and keeping them from intruding on our plantations.

Health Building For The Future

By SIR ALBERT HOWARD, C. I. E.

LONG Dene School, in 1939, boasted no more than twenty young scholars, at which period of its history it passed into the hands of Mr. and Mrs. John Guinness. From this nucleus they set out to build up a community in which parents and children alike should share the activities of hand and brain, and become both craftsmen and teachers, living and educating themselves together.

The project had its war-time difficulties. The 1940 evacuation of London swelled the ranks of Long Dene, and to the problems of additional accommodation, extra furnishings, and so forth, was added the expansion of food production on a limited area of land. One of the foremost aims of this experiment in community, described in *Sport and Country* of December 8th 1944 under the title, "Community Adventure", had from the outset been 'to raise as much as possible of its own food, so as to be sure of having at hand the fresh basic ingredients of a health-giving diet, grown on a well-cared-for and properly nourished soil.'

At the Manor House, Stoke Poges, Buckinghamshire, to which Long Dene School moved in September 1940, there was insufficient grass to feed cows, so goat-breeding was undertaken instead to supplement the younger children's milk supply. A chicken co-operative came into being, and a few stocks of bees added their quota to the register of garden produce. Meanwhile, a system of compost heaps had been organized, and home-grown food greatly improved, both in quality and quantity, as the composted garden came into yield. 'The soil on this property,' writes Mr. Guinness, 'is far from good, yet in 1943 the produce from one section of the garden included 1,000 lb. of tomatoes, 4,000 odd lettuces, 12 cwt. of onions, a ton and a half of cabbages, 2,000 lb. of spinach, sprouts, peas, and beans, and half a ton of early potatoes. These crops, plus some roots and marrows, were grown on one acre, part of the tomatoes and a few early lettuce being under glass.

'That ample, fresh and unspoiled contribution to the balance of the community's diet has had the most interesting effect on its general level of health. It has been one of the factors instrumental in producing, among adults and children alike, an unusual degree of disease resistance, amounting in some cases to complete immunity from colds, influenza and the common infectious ailments; and that without special precautions to isolate the children from contacts, in an overcrowded industrial neighborhood. Such an experiment in the creation of positive health needs to be continued over a longer period and on a larger scale than is possible in the present buildings; yet it is only one of a number that are waiting to be tried. Long Dene has clearly reached the time for another stage in its growth. More workers and their families are waiting to join than the

restricted space can accommodate, so a house is urgently being sought where land is available for agriculture, and there is room also for research and for the development of rural crafts and industries.'

Here is a practical experiment of great promise. Already important results are being obtained on the influence of properly grown food upon nutrition and health—results which, perhaps, will never satisfy the modern scientist who must calculate every minute detail and tabulate it, but results which may be seen and understood by the man in the street. Great things may be looked for from Long Dene community when peace-time brings an end to present restrictions. Many more such pioneering enterprises are needed which will build up on the sound foundation of soil fertility disease resistance and positive health in the future citizens of Great Britain.

Basic Resource

UNDER this title the conservative *New York Times* published on April 2, 1945 an EDITORIAL of statesmanlike import. As against Secretary Wickard's request that nitrogen and other chemical fertilizers be increased considerably over previous averages, the Editor says that there is another side to the restoration of our primary resources. "Soil needs organic material to hold moisture and thus make chemicals available to plants." He points out that remarkable progress has been made during the last decade on a nation-wide basis: The restoration of organic matter must be developed. We should add that there are two schools within the Department of Agriculture, the farsighted Soil Conservation Service and the zealous Agricultural Engineers and Economists. The latter visualize a future of chemical and technical farms replacing all subsistence farms and forcing "submarginal" land-holders into the factories and the wage-earner class, while the former believe with us, Louis Bromfield, and other historically and socially minded people, that submarginal land can be recovered by sound organic practices and that the independent life of free farmers is preferable to dependence on world economics and statistics. We believe in personal and social and national health, not in mere quantity production by concentrated machine methods.

Hints For The Victory Gardener

This is the thirtieth of a series of articles by this author dealing with the cultivation of ordinary vegetables.

PEPPERS

By ROGER W. SMITH

LIKE the tomato, the garden pepper *Capsicum annuum* is a native American. With other valuable native vegetables it has in recent years been rapidly gaining in popularity. It is distinct from the *Piper nigrum*, a tropical plant which produces the black and white pepper of commerce, the pepper found in your pepper shaker. The garden pepper had already reached a high state of development at the time of the discovery of America.

Because the pepper plant's requirements are so similar to those of the tomato, many good gardeners when setting out a planting of tomatoes, substitute pepper plants for tomato plants here and there throughout the planting. You might find this plan wise because it tends to prevent an excess of tomatoes over domestic requirements and furnishes a valuable crop of peppers.

Peppers were divided into two classes by the American Indian, viz, sweet and hot. Modern plant breeders have done relatively little to alter the basic types Columbus found. Most of them run rather true to type, a hint of the almost inconceivably long period over which this plant was cultivated by now almost forgotten American civilizations. So sweet or hot, you take your choice in planning your planting of peppers. However, in making your selection you have a vast array of desirable strains from which to choose, so many that each pepper plant you grow might well be different from the others.

The pepper has a rather long growing season and is very sensitive to frost. For this reason, pepper

plants are usually started in flats, pots, etc. placed in a sunny window in the house. These containers should be filled with sifted compost humus. Drainage and moisture conditions should be carefully complied with and the seed, not too

closely sown, should be covered with a half inch of clean sand. One ounce of seed will produce about one thousand plants. If you prefer to sow the seed directly in the garden you will have a wide margin of safety at sowing time since the seed requires ten or twelve days to germinate.

But whether you grow your own plants, purchase them, or sow seed in the garden, you will find that the proper selection and preparation of the area where the plants are to grow is the key to your success with peppers.

The pepper requires a well drained, open soil which is well supplied with natural organic matter. After all danger of frost has passed and the garden well dug and properly pulverized, the soil sweet, mellow, and well warmed, you go about the business of setting out your pepper plants. Where a plant is to be set an inch layer of mature compost humus should be lightly dug in. The plant should be set slightly deeper than it grew in the flat, be well watered with compost water, and be properly firmed.

After the plant is set and the area around it leveled, a liberal mulch of clean straw, leaves, etc., should be applied to avoid the necessity of much cultivation to keep down surface weeds. Raw manure should not be used, and after the plants are well along in their development, excessive watering should not take place since both of these factors encourage rank growth and inhibit the formation and maturing of the fruit.

There are many insects and plant diseases which sometimes attack peppers, but healthy, compost grown garden plants are seldom seriously affected. Even the activities of cutworms and wireworms which sometimes damage commercial pepper plants are largely controlled with the proper application of organic humus.

Although generally speaking you must choose between sweet or hot, peppers may be divided into four subdivisions.

(1) The large sweet types with fruits having thick walls and ideal when fresh-gathered for cooking, stuffing, and salad bowl, such as California Wonder (75 days to maturity) and Ruby King (68 days to maturity).

(2) Hot peppers that are old favorites such as Red Chili (82 days to maturity) and Tabasco (92 days to maturity)—rather too long for northern gardens. These hot fruits have many uses. A simple method of preserving their burning pungence is to place a number of slit or punctured fruits in a bottle filled with a good grade vinegar and allow to stand for a day or two. The resulting fluid is usually hot enough to satisfy even the enthusiast.

(3) Peppers for drying and winter use, such as Long Red Cayenne (72 days to maturity). Peppers are easy to dry. After the fruits have been harvested and given a preliminary drying by being spread out in a warm, dry place, they are sorted and the injured, imperfect fruits discarded. The best fruits are strung on a coarse thread, like large beads, using a needle. The string of fruits is then hung in some dry place in the house to continue drying and to be used as needed.

(4) The kind of peppers that Peter Piper picked, the pickling peppers, such as Large Cherry or Yellow Cherry (69 days to maturity). For methods of pickling peppers please consult the Victory gardener's wife.

How can you tell just when peppers are ready to be harvested? This depends very largely upon the type and purpose. Sweet peppers are most mild while still green. In

some types the fruits change from a green color to yellow or bright red as they ripen. In others the color change is not so apparent. Hot types are most pungent when allowed to remain on the plant until well ripened. In most types, especially the hot types, much of the hot flavor is concentrated in the ripe seed. Ancient peoples valued the hot types very highly both as a food and as a medicine. Only recently we discovered that the ripe, hot pepper is a superb source of Vitamin C.

In the growing of a few peppers you will doubtless find much that will bring you many moments of thoughtful wonder. As you watch over them you see, first, the sturdy plants clothed in glossy, heart-shaped foliage the dull-white flowers, then the swelling fruit concealed by the foliage which it so closely matches in color, and the wonder of the ripe fruit's brilliant redness. Beyond all, there lies the strangeness of the mysterious and obscure origin of this fine and valuable plant.

Although the pepper bears a perfect flower there is always considerable danger of cross pollination in the field. Any seed that you decide to save from some outstanding plant will most likely run fairly true. It is easily saved. The well ripened fruit should be kept in the house until it shows signs of wrinkling, then it should be split, the seeds removed, thoroughly dried, and stored. Not so long ago there was much discussion over the possibility of a hybrid pepper-tomato. Tomato shaped fruits were offered as evidence. However, the two plants belong to such distantly related genera that plant breeders today consider such a hybrid very unlikely. You might like to see what you can do.

But whatever types of peppers you grow, to what extent you become interested in the culture and habits of the plant, you may be sure that your success will depend very largely upon meeting the requirements of the plant and supplying its natural nutrients through the use of properly made and properly applied mellow compost humus.

Compost on the Farm

MANY farm readers ask whether composting can be done on a large farming enterprise. We have the figures of Mr. Sykes who did it in England. Without machinery it cost him about $3.50 per ton of manure or compost. Then he designed the Muck-Shifter, made by the firm of Ransomes and Rapiers, and now he reports: "Last month we dug, carted, and spread 400 tons of muck for a total cost of $128." One man working the machine can turn the compost at the rate of 200-300 tons per day. Another man sprays water at the compost in the process of turning at the rate of 4,000 gallons per hour.

We should, of course, consider that the farmer who diversifies and has the animals and pastures needed for such work makes a considerable saving on his fertilizer bill and we are sure that American ingenuity can produce a machine to do such work efficiently as soon as farmers are convinced that they want it.

Return To The Land

II.

The pH Question

By HEINRICH MEYER, Ph. D.

A reader with an orchard recently addressed Organic Gardening on the matter of pH, by which is measured the acidity of the soil. He wonders why it is so little discussed on our pages.

pH signifies the following complicated situation, which has to do with the electric charges of all elements in solution. If you turn a drop of water in the air, as happens before a thunderstorm, an electrical field is created, which, when sufficiently large, causes lightning. The same takes place everywhere in the soil, owing to movement of various solutions, with various concentrations. These small particles with electrical charges are called ions. It has been discovered that the normal hydrogen concentration is 10 to the -7th power. This figure 7 is then taken to indicate a neutral soil which is neither acid nor alkaline. It does not occur often in nature and not for long anywhere. If the figure is 8, the soil is ten times more alkaline; if it is 6, the soil is ten times more acid than at 7. Accordingly at a pH of 5 the soil is a hundred times more acid than at 7.

A slight acidity of the soil is necessarily required because without acids no minerals would be dissolved and the plants would be starved. On alkali soils next to nothing grows; the alkali-loving plants are very few and not among the cultivated plants. Every plant has a certain preference for certain acidities; this is determined by the whole evolution of the plant and the soils on which it customarily grew; but plants are very adaptable and develop strains more willing to accept sour or acid soils than others. Even new species are developed in that manner, one growing on different soil types from the other. Some plants, like corn, succeed at widely distinct acidity ranges, with an interval between that does not appeal to them.

The most important consideration in this connection is, however, that a soil varies in its acidity through the year, depending on temperature, moisture, and other factors. If there is much wind, the soil moisture is lower, and the acidity changes with it. It is possible that the dormancy periods of grasses, perennials, especially trees has something to do with soil acidity. A plant sucks, from the soil, solutions according to its own chemical make-up. Corn for instance collects aluminum in its nodal tissues; when a plant is intolerant to aluminum, it is as a rule not able to grow on the acid side of the soil types. It has been shown likewise that a plant's need for calcium (limestone) goes with the availability of phosphorus in the soil. Phosphorus is almost always present, but is largely supplied in Organic Gardening by the addition of

animal matter. Plants which have a great need for calcium, like mustard, buckwheat, hemp, then the turnips and other plants of the cabbage and mustard family, use first the easily soluble calcium carbonate —which is richest in organic soils— then they reach out for less available sources of calcium. The same relationships exist among animals. It has been shown, for example, that the humped buffaloes of the Balkans can utilize acid grasses better than any of the other bovines.

Those interested in physics will understand what happens when different charges of electricity occur in solutions. Most soil minerals are negatively charged and thus do not attract each other, but repel one another. Aluminum and Iron hydroxide are however positive and thus form in the soil firm complexes. This is one reason why the addition of aluminum sulfate is so dangerous. All the jellies and solutions of the soil are very sensitive to chemical influence; a soil could be completely ruined by heavy additions of mineral fertilizers. This happened in some irrigation districts.

It is here that the humus question is so important. The humus results from the decay of organic matter, that is, it contains large amounts of carbon. This carbon enters into many complicated relationships with the minerals in the soil. Thus a soil rich in humus has a much wider stretch for mineral content; accordingly a soil rich in humus may be more acid chemically because the carbon acts as a neutralizer or binder of substances which in pure form would be dangerous to the plants. This is one of the chemical causes for organic gardening. Colloidal chemistry and Organic chemistry have added so much knowledge and, we should say, so many unsolved puzzles on soil behavior that the early stage of analytical chemistry, the one which Liebig had to rely upon, has long been left behind. It is not a question any longer as to how much of a given mineral is added to, or present in, the soil, but how much of it is available for plants, how much is tied up permanently, how much can go in solution, and how easily various plant strains can utilize it.

Many cultivated varieties which do exceedingly well in Europe proved utter failures when introduced to the United States, not because they were poor seed, poor stock, or otherwise lacking in quality, but because they were originally developed for certain soils and climates; these plants became adapted to certain specialized soil and climate types, and would not immediately respond to American agricultural practices. The well-known case of Grimm's Alfalfa is quite in point. This legume had done exceedingly well in Grimm's original home; when grown in the Midwest, it failed. Only by persistent selection of surviving plants did Grimm succeed in developing the hardy strain that has evolved its innate adaptation to the new environment. We must not imagine that in the soil all sorts of minerals exist in one solution; this is an abbreviated way of expressing the situation. It is rather that the fine films of moisture covering minute soil particles become slightly enriched with a given mineral, just as the hand takes off a bit from a door handle—one can usually discover this metallic oxide by the smell. These minute films are differently charged according to the mineral present, and these charges start interacting among each other; exchanges take place on the surface of the films; the one particle is torn over into another film, and something else takes its place. Simi-

larly goes the feeding process of the plant itself.

These exchanges depend again on temperature and moisture, which determine the concentration of minerals. A humid clay has a different order of exchanges than an arid sandy soil. For this reason the physical condition of the soil enters so greatly into the picture. To give but two examples for the ratios in which calcium, magnesium, potassium, and soda stand on different soils: On Amarillo Silt the figures are 100:-24:17:1, while the same minerals occur in Davidson clay loam as follows: 35:8:4:3.

The finer the soil particles, the greater the amount of hygroscopic water that cannot be extracted except under the most enormous pressures. The coarser the particles, the fewer pores between them; accordingly, there is in a coarse soil, rich in sand, poor in humus, greater amount of gravitational water that seeps off, while the capillary water, that stands in the pores is less. Sand has a maximum capillarity of 16-20 as against clay with 40-50. This changes the chemical availability of nutritional elements completely. The importance of adding humus to the soil in the form of composted organic matter is therefore obvious. The finer the soil, the more nutritive substances are released and held for the use of plants. With this question goes, of course, also the water requirement of plants. It varies widely from swamp plants to desert plants, but even within one plant species the requirements are widely different.

The number of plants that require an absolutely neutral soil is small; alfalfa, sweet clover, red clover, cabbage, sugar beets, cauliflower are well described examples. But many more plants want a slightly acid soil. Corn, oats, wheat, barley, timothy, potato, beans, white clover, vetch, onions, tomato, lettuce are but a few in point; then there is a considerable group which thrives best or only on acid soil: Red Top, Bent Grass, millet, buckwheat, rye, fescue, soybean, cowpeas, alsike, lespedeza, while cranberry, strawberry, blueberry and the azaleas and rhododendrons, need a very acid soil. This does not mean that these plants can do without calcium; in fact, buckwheat requires a good deal of it; but calcium is an element, not only a soil conditioner. Likewise, if the soil has about half of one per cent of a salt such as aluminum salts, sodium salts, etc. in the soil, in other words, if it is an alkali soil, some plants will still grow, including barley, pears, citrus fruits, some grapes. It should be said here that the ammoniacal nitrogen that occurs in manure is turned into nitrate readily when calcium is present.

In the soil an extraordinary phenomenon takes place all the time, the so-called base exchange. The base of a salt may be potassium or magnesium or sodium, let us say. Under various soil conditions the following happens: A plant takes up the potash in preference to magnesium, and becomes accordingly richer in this material. The potash taken out of the ground is then replaced by another base. This has also extremely important health aspects: A number of years ago, some articles were presented by Professor Schrumpf-Pierron and Mr. Delbet before various learned groups in Paris; these scientists showed that soil not sufficiently supplied with Magnesium, which we supply in the form of Dolomite, produce plants too rich in potash, and they asserted that cancer was almost absent where food was eaten that was grown in soil rich in magnesium, while the excessive pres-

ence of radio-active potassium was one cause of cancerous and ulcerous growth.

Our few pointers on acidity do by no means cover the entire problem; they barely scratch the surface of soil fertility. It is obvious therefore that no general rules can be given on acidity; the problem is so complex that no chemist can foretell on the basis of a soil analysis, not even with the help of the largest laboratory staff and many soil samples, how plants will react; after all, the plants are highly varied; one strain of wheat is different from another; barley is not barley, but a certain well-specified strain of barley, certified as to its origin. So many matters have to be considered that it would be irresponsible for anyone acquainted with the subject to make glib statements on acidity. If a moderately acid soil is limed, less potassium is drained off; thus there is a relationship between the two minerals of calcium and potassium. Similar relationships exist undoubtedly between all the others. The mere task of discovering one such relationship and ascertaining its extent scientifically requires years of study. Much has to be done yet in this line. Too much, however, is being written about pH.

But one thing is certain: Mixed chemical fertilizers are an unsound approach to soil fertility. They are often a waste of money, too. But biologically speaking, everyone should know that plants take up the nitrogen at a different time from phosphorus or potassium. To offer them all in one mixture in a lump allotment is utterly unscientific in the light of present knowledge, though this is the practice of many. On the other hand, nobody can go wrong on Organic Gardening. If sufficient care is taken to enrich the soil in humose matter, composted plant residues and manure, not only is the bacterial life of the soil changed advantageously, but above all the nutritive problems of the plants are solved. For the soil receives again that which it has lost in producing a crop. It is highly important that the wastes be returned to the land, not washed away or burned up. This organic content balances the minerals, adds to the soil that structure which is most beneficial for the growing plant and makes for a sustained and increasing fertility of the land. The pH question, with which laymen are apt to play rather lightly, will then not ever arise, because humose soils will be in that slightly acid condition which are best suited to most of our cultivated plants. True, commercial agriculture will have to revise its program in the future if it wants to produce healthy plants on a long-range basis rather than grow them by either mining the soil or in an artificial nutritive solution annually added according to slipshod formulae; balanced farming and gardening, the production of enough animal matter will be required.

Instead of condemning more and more land as submarginal, we will under such a system regain the fertility of America and develop these "submarginal" soils to produce healthful food and sound feed. It can be done as Louis Bromfield and some others have proven conclusively. It can be done just as well on a subsistence level of balanced farming; this seems to us the task of our and all future generations: Returning to the Land in a holy zeal: Return the substances taken from the land, return by our work that which has been squandered. I personally do not care for the comforts of dependence. I cannot believe that the majority of the people would leave their land and prefer

work in a shop or factory. But I know that such a program of condemning more and more land and going more and more into the cities cannot be upheld for long; under present agricultural practices forgetting to return to the land its organic growth and produce, much land now successfully farmed on a commercial scale will become submarginal; besides, even the chemicals needed for the food of plants cannot be produced at will. They are as limited as the energy which is used in their extraction, conversion, and distribution. After all, our main source of energy comes from plants, and we are rapidly depleting the store that millions of past years have laid up; we are getting shorter and shorter on oil, coal, and wood. A thousand or two thousand years more, and we will be out of them. Then it will be inevitable to return to the land and to recover from the bilge of a wasteful dissipation.

The organic Gardener does something that should become a religion: Conservation of the treasures of nature.—Let no one forget that we have used up in the last seventy or eighty years more minerals and stored-up organic material than all the generations of mankind in billions of years before. Sure, this is progress! A fool who slides down into a ravine can also shout gleefully: "See how fast I am going!" But for how long?

Importance of Bees

SEED WORLD, the leading journal of the Seed Trade, splendidly edited by Mr. Anderson of Chicago, carried an article by C. J. Hudson, Jr., under the title *Fewer Honey-Bees Mean Less Legume Seeds.* The author who is with the H. G. Hastings Co. of Atlanta, Ga., spent several months in gathering the important data. Among the facts pointed out are: The 10 year average seed production of Alsike Clover was in Ohio 1.6 bushels; it could be 20 bushels if proper pollination were carried out by bees. Mr. Hudson quotes a seed authority to the extent that the economic production of livestock and dairy product depends on the available clover, alfalfa, etc. seed; this seed is very costly because we allowed bee-keeping to fall behind. Canada which buys bees in the United States succeeded in developing its seed production to an extent that we import some leading crops from there. There are fifty important crops, including fruit trees, whose yield depends mainly on bees. "Carelessness in spraying and dusting areas serviced by bees has brought much concern to the commercial beekeepers of the United States."—Yes, let's have bees and apples rather than DDT and universal death in nature!

Pleasant Valley

By LOUIS BROMFIELD

(Harper and Brothers, $3.00.)

A Book Review

"OWING to the reckless destruction of natural resources, our nation has already passed the peak of its incredible God-given wealth and is on the down-grade."—"Poor land made poor underdeveloped, undernourished people as well."

"The best book I know on soil and the processes which take part in it is *An Agricltural Testament* by Sir Albert Howard (Oxford University Press). It is the record of a lifetime spent in working with soil, its preservation and restoration, and the author approaches the whole subject with a kind of reverence and mysticism without which I believe the efforts of any agricultural scientist may, in the end, be of little value. Possibly no one knows more of soil and the principles that effect growth and fertility and abundance than Sir Albert, but his attitude is one of humility toward the still greater mysteries which he has not yet explored.

"A disciple of his and a friend of mine is the manager of one of the great stud farms of racing stock in this country and he was called to the job when the owner found that the quality of his colts was going rapidly downhill and that the colts broke down in the first few months of training. Everything known to race horse breeders was tried to build bone and stamina in the colts, for the stud farm and the racing stables were both acquiring a bad name, but the condition grew steadily worse, and as a last resort the owner summoned from England my friend, the disciple of Sir Albert Howard, who believes that the history of animals and plants and even of mankind is largely written in soil.

"The soil of parts of Kentucky and of Ireland are famous for the quality of the horses bred and raced there and the reason has long been apparent. It is that the soil of both regions contains or did contain the proper amounts of calcium and phosphorus and trace minerals to produce strong bone and a maximum of stamina.

"The stud farm which my friend took over lay in the very heart of the Kentucky horse-breeding area. Nevertheless when he went to the soil to find the secret of the stud's decline, he discovered that through farming over a long period of years in the violence of a climate in which there was freezing and thawing and heavy and violent rains, the amount of calcium and phosphorus in the land had become largelv exhausted or had leached away. The soil held the clue. No amount of breeding could have changed the quality of the horses feeding upon that depleted soil. Once calcium and phosphorus were returned to the soil of that farm, the quality of the colts produced there rose again to the old standards of a racing stable which once had been famous."

"The Indore process of Sir Albert Howard produces perhaps the ideal fertilizer."—These are some quotations from the new book by Bromfield who was translated into all European languages, who has actually seen the East, including the ruined parts of China, the workings of Indore, and who has lived for half of his life in other parts of the world before he escaped the wreck of Europe and build up a symbol of permanent security on his Ohio farm.

Literary critics with their snobbish delight in fads and arty tricks have frequently sneered at Louis Bromfield, but the wide public has loved him and disregarded the critics. Anyone who has any sense for real writing is bound to appreciate the straightforward account of the change of three run-down Ohio farms into a successful self-sustained enterprise; the beautiful description of his farm practices, which show that composting is feasible on a large American farm, in the form of sheet-composting; the life of the foxes, rabbits, dogs; the swimming pool and the sugar bush, the bird feeding, the contacts with the old neighbors, with Soil Conservation Service, even the building of the house, the incredible lives of the former owners; all of this is woven into a dramatic picture that unrolls itself before our eyes without losing for a moment in interest or weight; for this is not only a very rich and beautiful, but a most serious book which all our readers should read with pleasure. The next birthday present I'll give will be a copy of this book. Meyer.

(See ad on page 31)

The Fruit Orchard

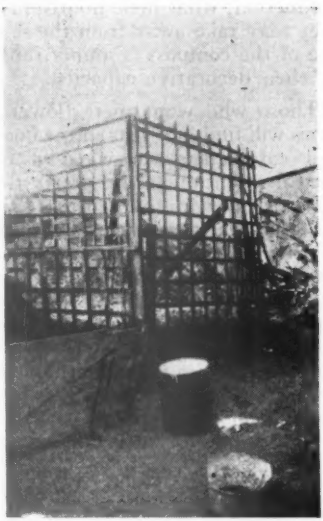
THE editorial staff of Organic Gardening has been busy with a new book No. 6 in our 25 cent series, *The Fruit Orchard*. Besides reprints of famous articles often requested by readers, it contains a complete survey of all the organic principles with regard to the handling of an orchard: Soil, mulch, root growth, pruning, poison sprays, mechanical means of dealing with insect pests, pollination, etc. Many articles were written specifically for the new book, among them one by Robert O. Barlow, author of the current series *A Modern Herbal*, one by Doris Clark, etc. Doris Clark also contributed masterful original drawings which enhance the value of the book. The book contains information about plums, cherries, and apples that are not self-fertile and gives reasons for such occurrences as June Drop, the appearance of sports, and other interesting matter rarely found in the larger books on the subject. There are two articles by J. I. Rodale, and Helen Papashvily, co-author of the current bestseller, *Anything Can Happen*, writes under her maiden name, Helen Waite, about an important orchard problem. *The Fduit Orchard* is now available. See our advertisement on the back cover. *The Fruit Orchard* is the first in a new series now offered in "Our Own Book Club."

Annual Vines

By DORIS CLARK

EDITOR'S NOTE: Mrs. H. J. Schauer, Roseville, Cal., sent us a snapshot which we reproduce below.

It is an enclosure for the compost heap, made of lath, 8 ft. high, and originally designed for keeping the dogs away from the pile. A wire mesh could, of course, be added. It occurs to us that shading the spot would not only improve the compost, but allow for the development of a beautiful corner in the garden. Annual Vines will serve the purpose.—



Three different plant families supply us with quick-growing vines that can be grown in the temperate zone, while others are available for the more Southern regions. There are the Morning Glory, the Bean, and the Cucumber families, each one with numerous species suited to covering trellises. Of course, if you want permanent covers, the range is unlimited; but with that aspect we shall deal some other time.

The Morning Glories (*Convolvulaceae*) are a very interesting family in the order of tube-flowered plants; most everyone knows the common *Bindweed* which, in the morning, has that fragrance of bitter almonds. The *California Rose* is a perennial relation, and the common *Dodders* of clover, flax, hops, and field are parasitical relatives. The sweet Potato is another member of the family. For ornamental purposes we would, however, use the *Morning Glories* that the catalogues offer in profusion; some of them are perennials, many are in our latitudes only annuals. They climb to the right of the pole, a tendency that must be watched when guiding them along a trellis. As a rule, one can observe their growth from day to day. The flowering periods vary considerably, but with the entire family they are rather extended; blossoms are out for weeks on end. The gentle *Cypress Vine* has its home in the tropics, but is marching to the North acclimating herself as she proceeds. Its ruby chalices are among the most delicate flowers, short-lived like all others in the family. For each one of these blooms but for a day or a night. The *Moonflower* is a nightbloomer, opening its big white calyxes with their penetrating perfume to attract the magnificent moths, such as the most beautiful of the night, the Luna moth. By a proper mixture of these different climbers, the trellis can be made into an almost

tropical show place for all times of the day and the night.

The *Bean* family is not often looked upon as having decorative value, though I can hardly think of a prettier sight than pole beans with pods in yellow, green, and blue; or scarlet and white runners with their richness of flowers. Robert O. Barlow's recommendation of these latter in *A Modern Herbal* (April issue of *Organic Gardening*) deserves most serious attention; for beans are not only useful and healthy, but extremely beautiful, especially when they are chosen for their appearance as well.

Every seed catalogue has a packet of ornamental *Gourds* to offer. There is a charming book on gourds by Bailey with beautiful illustrations. To sit in the shade of a gourd arbor, to watch the shadows of the tendrils, leaves, and flowers, is a dream for the artist and a pleasure to the gardener. All cucumber plants, such as the Gourds, have male and female flowers separate. First there appear numerous male flowers, last a day and are pushed off; before long the next one, on the same stem opens and the same useless procedure takes place. Then come the female blossoms too, bigger and showier, easily recognized by the pistil and the ovary beneath that will form into the gourd or the cucumber when the bumble bees, moths, and other insects have transferred the pollen from the male flowers. Throughout the growing season, as long as it is warm enough, such reproduction continues, and gourds are formed. In this connection, we should also mention the *Luffa* or dishrag gourd, whose seed was frozen by the government because the fibrous interior of those fruits is used for swabbing out guns, just as before the war it served in the bathroom as a natural scrubber or in the kitchen as a pan cleaner. Here and there someone may have a few seeds left which he could usefully employ on such a structure as the one shown in the picture. By the way, young luffa gourds can be eaten like zucchini.

All of these vines will look good and at the same time be useful, either for shading or even for food production; what little nourishment they may take away from the seepage of the compost is amply repaid by their decorative capacity.

Those who want mere flowering vines will find long lists in the books and catalogues; we would call special attention to the pretty *Clematis,* to *Cobaea,* and to the *Coral Vine.* While the former does well in the North, the latter two are fond of Southern climates and their length of day. For many plants do not so much respond to temperature as they do to light. The fact that the *Moonflower* is a nightbloomer, while its close relative, the *Cypress Vine,* comes out in the day, is a good example for such different responses.

USING THE WHIP

"I ran into an old farmer the other day and he said that using chemical fertilizers is like using a whip on a horse. It speeds him up for a while and then he goes much slower than before."

From a letter by Orville Dew, Cleveland, Ohio.

Excessive Leaf Growth in Vegetables

By ROGER W. SMITH

WHY do some gardens produce luxuriant, leafy plants that fail to develop satisfactorily that part, either root, fruit, or seed, for which they are grown?

To find the cure for this condition suppose we cause it. In a well established meadow we place a pen densely inhabited by chickens and allow it to remain there for some time. Then we move the pen and allow the meadow grasses in that area to grow again undisturbed. The weedy growth that follows the removal of such a pen is almost invariably rank, lush and leafy. What caused this change?

As we know, raw chicken manure and chicken feathers contain a very high percentage of nitrogen. Because of this the penned area of the meadow received a heavy supply of raw material, rich in nitrogen, and for that reason the plant growth that followed ran all to leaf. Much the same sort of thing may result in the home garden through the introduction of a relatively small but steady amount of highly nitrogenous substances, manure, kitchen scraps, etc. believed—and rightly so—to have much plant food value.

The use of raw manure and other substances may throw the garden out of balance and rank, leafy growth may result for several seasons unless something is done to correct this condition. Nature will, of course, eventually straighten matters out. In the meantime, what should the gardener do?

At first glance it might seem that, because the nitrogen content of the garden is too high, the potash-phosphorus level should be raised by the introduction of these substances. If this were managed by the use of poisonous chemicals, an even more unnatural condition will exist, for then all three vital elements will be equally excessive and the resulting crop, if it survived, would probably be valueless.

Since attempts at compensation are out of the question the thing to do is to get rid of the excess of nitrogen by absorption if possible—and wish the chicken manure had been used on the compost heap. The condition may be corrected in several ways: by the application of large quantities of lime to offset acidity and to encourage the activity of beneficial bacteria; by the addition of large quantities of poor top soil or sand; by the application of large quantities of water; by frequent digging, especially during warm weather; and by the addition of mature compost humus.

Where speed is desired, the addition of poor top soil, sand, and the use of water may be warranted. Under normal conditions, however, deep digging, the incorporating of generous quantities of mature compost humus and finely ground limestone are far more satisfactory.

Most home gardens are dug rather frequently and tend to maintain

normal balance even though they receive raw manure. The beneficial activity of soil bacteria is greatly increased by digging and this extra activity is usually sufficient to maintain soil balance. Extra digging may be sufficient to prevent the formation of too great an amount of rank, leafy growth and only a moderate amount of lime may be required. Often, the balance of the vegetable garden where composting is not practiced depends very largely upon the gardener in his digging keeping pace with the entrance of new supplies of raw manure.

The application of mature compost humus during digging will quite often provide enough body to most soils, especially those deficient in organic humus, so that any excess of nitrogen is absorbed and the breakdown of the raw material greatly facilitated.

Sometimes excess leafy growth develops because of other reasons. The drainage and character of the soil may cause irregular leafy growth especially if the soil makes available excessive amounts of moisture high in nitrogen immediately before the ripening period. Roughly, the garden drainage may be checked by observing and correcting any spots where pools of water form and remain for any great length of time after rain. Sometimes unseasonable summer rains can so increase leafy growth as to be disastrous to certain crops.

The gardener confronted with the problem of cultivating a garden which has a reputation for producing rank growing vegetables may wonder if the material used in his compost heap might not be changed according to conditions. This is a fair speculation.

Many practical gardeners believe that if the amount of raw manure used in the compost heap is doubled the resulting humus will favor quick leafy growth; that if the amount of raw manure used is curtailed or altogether absent, the resulting humus will be most suited for the production of slow-growing, stocky plants.

Therefore, it seems reasonable to suppose that where rank growth persists in spite of all that has been done it may be advisable to incorporate in the compost heap, along with the layers of top-soil, increasing amounts of vegetable ash, not necessarily hard-wood ashes for these may be difficult to obtain. Unleached ashes of most vegetable substances are almost always high in potash and phosphorus. Nevertheless, it is to the product of the normal, well made, compost heap that in the end, we must look for the real correction of this condition.

The problem of overcoming excessive leaf growth is an interesting and involved one. Some geographical areas seem to favor leafy growth, other wide areas seem to favor root growth. In our gardens we try to grow many kinds of plants each having very different requirements. Not all thrive under identical conditions although in a garden which is kept in normal balance through proper tillage and the addition of mature compost humus, almost all ordinary vegetables will develop their edible parts.

It is in the understanding of the conditions which prevail in his garden that make the skillful gardener. He knows that the health of his compost heap depends upon the materials which form it and the care used in its construction; he knows that, in turn, the health of his garden soil very largely depends upon the health and maturity of the composted organic humus with which it is supplied.

Botany For The Gardener

Climbing Plants

By JOHN ANDERSON

IN my childhood days our family used to take walks on Sunday afternoons and my father would point out some elementary matters in botany; when I grew older, this treasure of my younger years was increased by reading and studying, but I had formed the habit of watching nature while young; this is essential, I think. For when I now look back upon those earlier days, they appear to me in a golden haze of poetry and beauty. I wish to contribute my share now so that others who do not have my father's knowledge of plants may profit by my early training and hand it down to their children in order that they again can look back some day in the future upon a rich youth, full of natural wonders and love for the things that man cannot make, but only grow. For all civilization rests on unbroken tradition.

One time I said to my father: "You have shown me the seeds of alfalfa are coiled; but you have never told me why there is a large family of plants called climbers."

He smiled, for I was misusing the right terms in my naive way, and I can still recollect my slight embarrassment when he said: "The climbers belong to many different plant families that have nothing in common except that they climb, just as others have trunks that stand up firmly by themselves."

And so it is. The distinguishing feature of climbers is that they have formed *a means of extending their natural reach* by using other plants or objects to hold on to, either by winding around them or by fastening themselves onto them with tendrils or rootlets.

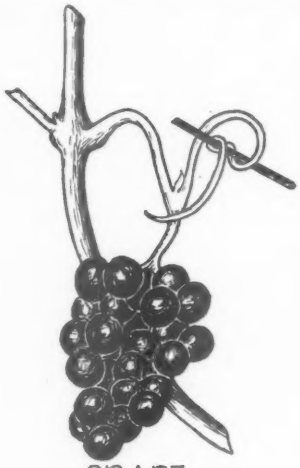
When you look at a growing twiner, which has no tendrils, let's say, a bean or a morning-glory,

you will find that the end of the stem makes regular fishing movements. Darwin observed them and measured the time it took for some plants to complete a full circular motion. He found that a morning-glory tip got around in 1 hour and 42 minutes, while hops after 36 revolutions came down to its regular time of 2 hours and 8 minutes. These movements are, when looked upon from the top, either like the

hands of the watch, with the sun, as in hops, or in the opposite direction, as with morning-glories, beans, thunbergias, and many others. Darwin also noticed one plant, a loasa. From 17 seedlings, 8 turned against the sun, 5 with it, while 4 changed their course. This irregularity is highly unusual, but also highly important, because it leads over to those plants which climb by leaves or tendrils, organs that, as a rule, are not so particular about the manner in which they wind.

A winding stem is necessarily much longer than a straight one; it requires therefore much more energy than a straight growth before it has reached the light and air at the height to which it aspires. A straight plant that can hook its leaves to any branch or twig on its way up, not only makes itself independent of the trunk or stem which the climber needs; it also saves a good deal of energy by having special organs for holding on. Darwin gives as example a certain clematis (*C. glandulosa*) whose leaves respond to slight constant pressures by thickening and forming "muscles." He discovered also that a relatively heavy drop of water did not have the effect on the tendril and leave climbers that a tiny bit of fine thread exerted. The plant wants to know whether there is really an obstacle to hold on to; the heaviest drop of water does not affect it because it would not offer support.

The majority of the tendril bearers are well-known to every grower of grape vines, of cucumbers and gourds, of passion-vines, coral-vines, etc. The forms of the tendrils vary according to the origin; it is unfortunate that Darwin did not watch the coral-vine with its hooked tendrils, which are so different from most others. The scientists have argued a great deal as to the origin of these holding organs, whether they are forms of leaves or some other bodily part; for they are an evolutionary development of high usefulness and considerable



GRAPE

sensitiveness. A number of years ago, I visited Dr. Barlow and Dr. Meyer in Texas; both were delighting in their luffa gourds and other climbers; we watched the wart-like excrescences of the moonflowers, which are genuine twiners, and of the luffas which are like all cucurbits (cucumber plants) tendril bearers. Dr. Meyer demonstrated when and how a luffa tendril could be wound around a wire so that it would stick. He stroked it a few times, watched how it naturally rolled, and wound it in that direction; it would hold to a clothes line; if wound otherwise it would presently uncurl. Up to a certain stage such a tendril could be stuck in a small crack of the wall, where it would thicken to hold on; after that it was strong enough to support the weight of a number of heavy gourds; but once it had be-

come woody, it lost its pliability. We noticed that of the three prongs of a tendril the center part was the first to mature. How important these holding organs are can best be seen in the European grape-vine, (*Vitis vinifera*), where the tendril so often serves the purpose of holding the heavy fruit.

Most genuine twiners, like hops or beans, actually have little hooks that you can easily feel. Other plants have developed strong thorns and anchors with which they support themselves; but a large number of plants, like ivy and poison ivy, possess genuine roots by which they grow up on a tree or a wall. Ivy succeeds on stone walls by means of excreting a fluid which allows it to sink its rootlets into the stone. The lianas of the virgin forest with their thorns could hold on to a slope, our Northern ivies actually grow on it.

It would be ridiculous for any man to say that one given cause prompted all these varied developments in so many different plant families. Nature is rich and finds thousands of solutions for one problem. Some plants have trunks, others are herbs that propagate every year, while again others have rootstocks or bulbs so that they can build up reserves in one year and grow seed the next; similarly, some plants become woody climbers that stay, like trees, through the years, while others grow like herbs, either from a permanent rootstock or from the annual seed. But that is another question which we shall investigate another time.

Poison Sprays on Washed Apples

UNWASHED apples contain as much as a grain of lead in ten pounds of apples. Eight grains of lead injected in the bloodstream of a dog have caused the death of the animal. Lead is not soluble in ordinary water and can therefore not be washed off easily; but even though York Imperial apples were washed in a solution of hydrochloric acid (1.5%), every hundred pounds of fruit contained three grains of the deadly poison, a recent bulletin by the Department of Agriculture showed, after the most painstaking investigations by Haller, Cassil, Gould, and Schrader. A person who eats a couple of apples a day, would therefore accumulate a considerable dose of the poison in a season. True, the apples were not worm-eaten, but their beauty and uniformity was purchased at the price of health and possibly at the cost of permanent danger to the system. Chronic lead poisoning is a serious medical problem: The red blood corpuscles are reduced and destroyed by lead; nervous disorders ensue; digestive ailments can follow. The ultimate results of such chronic food poisoning are not known, because we have only about one generation of lead-eating behind us. The lead arsenic ratio is not favorable: as a rule more arsenic than lead is lost on the fruits, yet another poison for the human system to contend with. If the grading for appearance and standardization are important we have made progress by eliminating small and wormy fruit; but if sustained health is the question, we have failed completely. The day will come when only organically grown fruit, carefully picked, will be marketable; when eye appeal caused by the spraying machine will be looked upon as foolishness.

Reader's Correspondence

Attention is again called to the rule that a stamped envelope should accompany every request. Some readers have become a bit slack. Due to the hundreds of questions which we have to answer, cooperation in this respect will save us postage and allow us to concentrate our resources on the main cause: *Organic Gardening.*

ORCHARD MULCH

Q. I appreciated very much your splendid editorial entitled "Orchard Practices." This answered many questions that have bothered me for some time. With so much spraying and pest control to worry about, it is hardly worthwhile to attempt a small orchard. But organic gardening methods will take all the drudgery out of the care of an orchard and make fruit culture a joy. How about mulches under trees? Would one part composted humus from my heap with one part of sand be better than sandy loam. How much peat moss should I use for each tree?

H. C. White, Gardena, Calif.

A. Partially composted material is not good for trees especially. I believe that straw is a somewhat better mulch than leaves because it would permit the moisture and rains to penetrate better. An ideal mulch would be a combination of straw and leaves so that there would be no packing of leaves at any one point. Everything that is half-finished should be considered a mulch, while fully made compost is a good fertilizer and the only kind that should be used with fruit trees.

GRASSHOPPERS

Q. Will you please advise what the best method may be to eliminate grasshoppers from lima beans? They seem to have a very fine time eating the blossoms from my plants.

J. E. McWhorter,
Charleston, W. Va.

A. Grasshoppers can, of course, be baited by various baits laid out in the morning; but a sound non-chemical method is the use of buckets or tubs with water and a light placed nearby. Thus one gets grasshoppers that *can be fed to chickens.* The best way is the encouragement of all natural grasshopper enemies, the birds!

SPRAYS

Q. Can you give recipe for spray that is harmless to soil and users of fruit, but effective in destroying pests?

Julius Meisenbach,
Hendersonville, N. C.

A. You are asking for something that I believe is well-nigh impossible. Any mixture or compound that is strong enough to destroy pests will kill off also beneficial organisms in the soil since all these sprays find their way to the soil. Anyone that could provide such a safe mixture could easily make a million dollars.

There is some indication, however, that certain organic mixtures do have some inhibitory effect on insects. For example, there is to-

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bacco. It is claimed that nasturtiums, grown under fruit trees, will control the woolly aphis. This is not to be confused with the ordinary aphids which are harmless to fruit trees. One of our readers claims that he obtained results with growing pepper plants which seem to be too strong for insects. A combination of various extracts of such plants might be effective. However, when you come to such strong mixtures as pyrethrum, which comes from a poisonous plant that can paralyze fish, then we draw the line. Such mild liquids as soap and water also have a controlling effect on insect life in a mild way.

For the last three years we have had marvelous vegetables without any sprays of any kind. We had potato bugs on a very small scale and we picked some of these off by hand.

ALFALFA FOR HUMAN FOOD

Q. What do you think of the use of alfalfa in the garden; could it not be used also for human food? We are vegetarians and would like to hear of your opinion.

R. Graham,
San Francisco, Calif.

A. Alfalfa is used in some parts of Pennsylvania as a salad vegetable, and as a tea it is said to be *helpful in curing diabetes.* Recently, it was tried out in a vitamin product that was tested, if we recall correctly, in a leading woman's college. What you suggest to the gardener has probably not been carried out for reasons of space, though the farmers have for a long time used alfalfa as a fertilizer and nitrogen-gatherer. The nitrogen-fixing bacteria collect on the inoculated alfalfa seed and, after using small amounts of nitrogen from the soil,

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begin to derive more of the valuable substance from the air; thus they enrich the soil and make it more fertile. Alfalfa roots reach down deeper than those of any other leguminous plant, and alfalfa also is a heavy consumer of water. You may be interested in reading about alfalfa in *Louis Bromfield's new book which we discuss in this issue.* He made quite some discoveries about its use on the farm. While the Organic Gardener can teach the farmer much about composting, the farmer has his lessons to return about green manure crops. At this time, alfalfa seed is not easy to obtain. You may have to try some other leguminous crop instead. You might also try a grain crop on an intensive scale. The seeds could be used for food, the residues for the compost heap. Experimenting with grain crops on a gardening scale seems to us very promising.

SUNFLOWER SEEDS

Q. I was interested in your sunflower seed article which I read in a reprint in another magazine. Could you tell me how much one should eat to get the real benefit?

Erma Long,
Port Arthur, Tex.

A. As to sunflower seeds, we find no definite measure for all needs. Ordinarily, we say: "A few hands full" a day and think that this covers about the amount desirable. Much also depends on the seeds, some are large and others are thin, according to the variety of sunflower grown. You should get a nice crop in at Port Arthur.

Please mention ORGANIC GARDENING when answering ads.

CUTWORMS

Q. Have you any literature dealing with the control of cut-worms? For two seasons they have cleaned our garden out when plants are about 1 inch high. They work during the night.

Ida Oatley Howell,
Mesick, Mich.

A. The cut-worm question has everyone baffled. The manuals on insects admit freely that no chemical device is available to combat these worms. They have to recommend what we ourselves have frequently recommended in the past that the ground be frequently harrowed so that the *worms or the eggs be exposed* and picked up by birds, toads, lizards and other natural enemies of the worms.

Cut-worms are fed on by some insects who live in them as parasites. As you proceed to improve your garden by organic methods, the chances are that the cut-worm menace will disappear as it has in the Rodale garden in Emmaus.

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